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STANDARDS	PROPOSED CHANGES TO RULES	COMMENTS
Draft 2014		
10.58.528 COMPUTER SCIENCE		
(1) The program requires that successful candidates:	(1)The program requires that successful candidates:	
(a) demonstrate knowledge of computer science prerequisites consistent with, and substantially beyond, that which a classroom teacher may be expected to teach;	(a) demonstrate knowledge of computer science ~~prerequisites consistent with, and substantially beyond, that which a classroom teacher may be expected to teach;~~ content, models, important principles and concepts:	
	(i) demonstrate knowledge of, and proficiency in the use of primitive data types	
	(ii) demonstrate an understanding of data representation at the machine level.	
	(iii)demonstrate knowledge of, and proficiency in the use of static and dynamic data structures	
	(iv) demonstrate knowledge of and proficiency in the use of common data abstraction mechanisms (e.g. abstract and generic classes such as stacks, trees, etc.)	
	(v) effectively use, manipulate, and explain external data stores – various types, (text, images, sound), various locations (local, server, cloud)	

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(b) demonstrate knowledge of algorithm design, analysis, and implementation in a programming language, data structures, and abstract data types covering:	(b) demonstrate knowledge of algorithm design, analysis, and implementation in a an object-oriented programming language, using data structures, and abstract data types covering:	
(i) problem solving techniques and strategies;	(i) problem solving techniques and strategies;	
(ii) algorithm design methodologies;	(i) knowledge of algorithm problem solving techniques and strategies and design methodologies;	
(iii) algorithm verification;	(ii) knowledge of algorithm verification	
(iv) algorithm analysis;	(iii) knowledge of algorithm analysis complexity and efficiency	
(v) data structures and abstract data types;	(v) data structures and abstract data types;	
(vi) at least two programming languages, including object-oriented programming and/or other current programming trends; and	(iv) knowledge of at least two one of the programming languages, including object-oriented programming C++, Java, C#, or Ada, and/or one other current programming language, and current programming language trends;	
(vii) program testing;	(vii) program testing;	
	(c) effectively design, develop, and test programs;	
	(i) using a modern high-level programming language, construct correctly functioning programs involving simple and structured data types; compound Boolean expressions; and sequential, conditional, iterative, and recursive control structures.	
	(ii) using a modern high-level programming language, construct correctly functioning programs involving simple and structured data types; compound Boolean expressions; and sequential, conditional, iterative, and recursive control structures.	

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	(iii) design and test programming solutions to problems in different contexts: textual, symbolic, numeric, graphic, etc.) using advanced data structures	
	(iv) demonstrate knowledge of and skills regarding the syntax and semantics of two high level programming languages (other than those covered in I.B.5 above), their control structures, and their basic data representation.	
	(v) demonstrate knowledge of and skill regarding program correctness issues and practices (i.e. testing, test data design, and proofs of correctness)	
	(vi) demonstrate knowledge of and skill regarding at least three different program development environment in wide-spread use.	
	(vii) demonstrate knowledge of, and the ability to construct multi-threaded client-server applications	
	(viii) demonstrate knowledge of, and the ability to construct web sites that utilize complex data bases	
	(ix) demonstrate knowledge of, and the ability to construct artificial intelligence and robotic applications.	
	(x) demonstrate knowledge of the principles of usability and human-computer interaction, and be able to apply these principles to the design and implementation of human-computer interfaces	
(c) demonstrate knowledge of the major subject areas of the discipline of computer science, including; (i) algorithms and data structures;	~~(c) demonstrate knowledge of the major subject areas of the discipline of computer science, including;~~ ~~(i) algorithms and data structures;~~	
(ii) programming languages;	~~(ii) programming languages;~~	

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(iii) architecture and machine-dependent programming;	(iii) ~~architecture and machine-dependent programming;~~	
(iv) numerical and symbolic computing;	(iv) ~~numerical and symbolic computing;~~	
	(d) demonstrate knowledge of computer systems and networks.	
	(i) describe the operation of a computer system, CPU & instruction cycle, peripherals, network components, and applications – indicating their purposes and interactions among them.	
	(ii) describe the operation of a computer system, CPU & instruction cycle, peripherals, network components, and applications – indicating their purposes and interactions among them.	
	(iii) demonstrate a understanding of operating systems	
	(iv) demonstrate an understand of computer networks	
	(v) demonstrate an understanding of the issues involved in building and fielding mobile services	
(v) operating systems and networks;	(v) ~~operating systems and networks;~~	
	(e) demonstrate an understanding of software engineering.	
	(i) demonstrate an understanding of the difference between computer science and software engineering	
	(ii) demonstrate an understanding of software development methodologies and the software development life cycle	
	(iii) demonstrate an understand of the the purpose and contents of the software engineering body of knowledge (SWEBOK V3)	

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(vi) software methodology and engineering;	~~(vi) software methodology and engineering;~~	
(vii) database and information retrieval;	~~(vii) database and information retrieval;~~	
(viii) artificial intelligence and robotics; and	~~(viii) artificial intelligence and robotics; and~~	
(ix) human-computer interaction;	~~(ix) human-computer interaction;~~	
(d) demonstrate knowledge of: (i) team software development; and	~~(d) demonstrate knowledge of:~~ ~~(i) team software development; and~~	
(ii) personal written and oral communication skills;	~~(ii) personal written and oral communication skills;~~	
	(f) demonstrate an understanding of the key concepts of computer/information security.	
	(i) demonstrate an understanding of the concept of "attack surface" and the various methods used to minimize an attack surface	
	(ii) demonstrate an understanding of the importance of maintaining logs of all system activity related to security.	
	(iii) demonstrate an understanding of the purpose and general functionality of a firewall	
	(g) demonstrate an understanding of the role computer science and software engineering plays in the modern world.	
	(i) demonstrate an understanding of significant historical events relative to computers and information systems	

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	(ii) demonstrate an understanding of the social, ethical, and legal issues and impacts of computing and information systems	
	(iii) demonstrate an understanding of the contributions that computer and information science and software engineering make to science, the humanities, the arts, commerce, and entertainment	
	(iv)demonstrate an understanding of social issues related to the use of computers and information systems in society and the principles for making informed decisions regarding them (e.g. security, privacy, intellectual property, equitable access to technology resources, gender issues cultural diversity, differences in learner needs, limits of computing, rapid change)	
	(v). Demonstrate an understanding of the many different careers that are closely related to the development and use of computer and information systems	
(e) demonstrate knowledge of computing issues, including: (i) the history of computing;	(e) demonstrate knowledge of computing issues, including: (i) the history of computing;	
(ii) current trends and future directions in computing;	(ii) current trends and future directions in computing;	
(iii) career opportunities in computing;	(iii) career opportunities in computing;	
(iv) ethical and moral obligations in the use of computer hardware and software;	(iv) ethical and moral obligations in the use of computer hardware and software;	

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(v) impacts of computing on society;	(v) impacts of computing on society;	
(vi) practical, hands-on experience with widespread software applications, including: (A) productivity tools;	(vi) practical, hands-on experience with widespread software applications, including: (A) productivity tools;	
(B) communications and networking;	(B) communications and networking;	
(C) multimedia/authoring tools;	(C) multimedia/authoring tools;	
(D) instructional software; and	(D) instructional software; and	
(E) operating systems software;	(E) operating systems software;	
	(g) candidates demonstrate effective content pedagogical strategies that make the discipline comprehensible to students and:	
	(i) select a variety of real-world computer problems and project-based methodologies that support active and authentic leaning and provide opportunities for creative and innovative thinking and problem solving	
	(ii) demonstrate the use of a variety of collaborative grouping in lesson plans/units and assessments	
	(iii) Design activities that require students to effectively describe computing artifacts communicate results using multiple forms of media	
	(iv) Develop lessons and methods that engage and empower learners from diverse cultural and linguistic backgrounds.	
	(v) Identify problematic concepts and constructs in computer science and appropriate strategies to address them	

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	(vi) design and implement developmentally appropriate learning opportunities supporting the diverse needs of all learners	
	(vii) create and implement multiple forms of assessment and using the resulting data to capture student learning, provide remediation, and shape classroom instruction.	
	(h) candidates apply their knowledge of learning environments by creating and maintaining safe, ethical, supportive, fair, and effective learning environments for all students and:	
	(i) design an environment that promotes effective teaching and learning in computer science classrooms and on-line learning environments and promotes digital citizenship.	
	(ii) promote and model the safe and effective use of computer hardware, software, peripherals, and networks	
	(iii) plan for equitable and accessible classroom. Lab and on-line environments that support effective and engaging learning.	
	(I) candidates demonstrate professional knowledge and skills in their field and readiness to apply them and:	
	(i) participate in, promote, and model ongoing professional development and life-long learning relative to computer science and computer science education;	
	(ii) Identify and participate in professional computer science and computer science education societies, organizations, and groups that provide professional growth opportunities and resources.	

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	(iii) demonstrate knowledge availability and use of resources such as journals, sources of computer hardware and software, relevant conference titles, and professional organizations	
	(iv) demonstrate the ability for the continual study of effective pedagogical uses of computers	
	(v) demonstrate knowledge of evolving social and research issues relating to computer science and computer science education.	
	(vi) Identify local, state, and national content and professional standards and requirements affecting the teaching of secondary computer science	
(f) deal with computing issues unique to the classroom, including: (i) computer hardware and software management such as hardware setup, software installation, and network level hardware and software trouble-shooting and maintenance	(f) deal with computing issues unique to the classroom, including: (i) computer hardware and software management such as hardware setup, software installation, and network level hardware and software trouble-shooting and maintenance	
(ii) availability and use of resources such as journals, sources of computer hardware and software, relevant conference titles, and professional organizations;	(ii) availability and use of resources such as journals, sources of computer hardware and software, relevant conference titles, and professional organizations;	
(iii) continual study of effective pedagogical uses of computers as a means to stay updated;	(iii) continual study of effective pedagogical uses of computers as a means to stay updated;	
(iv) hands-on use of hardware, software, and operating systems common in schools;	(iv) hands-on use of hardware, software, and operating systems common in schools;	
(v) develop online/electronic class formats; and	(v) develop online/electronic class formats; and	

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(vi) trends and innovations in computing curricula; and	(vi) trends and innovations in computing curricula; and	
(g) apply assessment tools and practices that range from individual and group tests, to individual and group informal classroom assessment and strategies, including technology-based assessment tools.	(g) apply assessment tools and practices that range from individual and group tests, to individual and group informal classroom assessment and strategies, including technology-based assessment tools.	
(History: 20-4-102, MCA; IMP, 20-4-103, MCA; NEW, 1991 MAR p. 300, Eff. 3/15/91; AMD, 1992 MAR p. 1475, Eff. 7/17/92; AMD, 1994 MAR p. 2722, Eff. 10/14/94; AMD, 2000 MAR p. 2406, Eff. 9/8/00; AMD, 2007 MAR p. 190, Eff. 2/9/07.		